No.	Publication No.	Title
1.	2002 - 160412	METHOD OF CONTROLLING PRINTING, AND DEVICE

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-160412

(43)Date of publication of application : 04.06.2002

(51)Int.Cl. B41J 19/18
B41J 29/38

(21)Application number : 2000-356815

(22)Date of filing : 22.11.2000

(71)Applicant : CANON INC

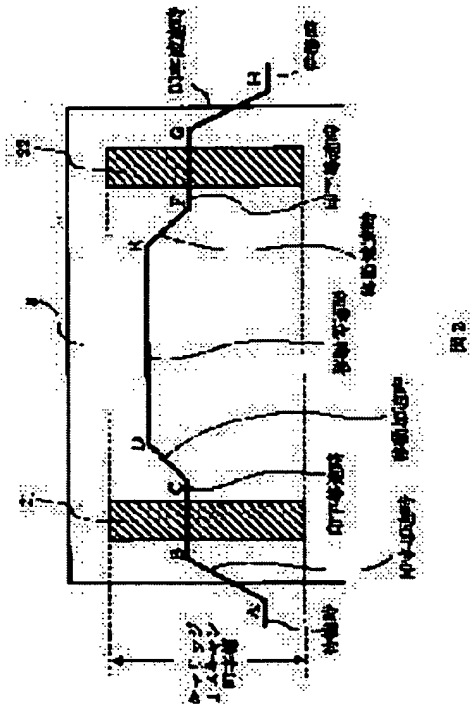
(72)Inventor : TAKAHASHI SHINICHI

(54) METHOD OF CONTROLLING PRINTING, AND DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To improve a total throughput in printing by a method wherein a region having print data and a region not having print data in a carriage scanning region are detected and speeds with respect to the respective regions are controlled to be varied.

SOLUTION: A blank portion existing in the middle part between a plurality of printing regions 21, 22 in one band region corresponding to a printing width which is to be printed by a print head by one time of scanning of a carriage and a shortest distance in the direction of scanning of the carriage in the detected blank portion is obtained. It is checked whether or not the obtained shortest distance is greater than a predetermined threshold. When it is judged that the distance is greater than the threshold, the carriage speed in the blank portion is increased to be greater than the normal carriage speed.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

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[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

[Translation done.]

CLAIMS

[Claim(s)]
[Claim 1] By the print head carried in carriage, making carriage scan in the conveyance direction and the direction which intersects perpendicularly to the printing medium conveyed in an one direction The step which detects the null section which exists in the middle of two or more printing areas which can be set in 1 band field which is the printing control approach which forms an image on a printing medium, and is equivalent to the print width printed by said print head by one scan of carriage, The step which finds the minimum distance in the carriage scanning direction of this detected null section, The printing control approach characterized by having the step which confirms whether this found minimum distance is larger than the threshold defined beforehand, and the step to which the carriage rate in the null section concerned is made to increase from the usual carriage rate when it is judged beforehand that it is large.
[Claim 2] By the print head carried in carriage, making carriage scan in the conveyance direction and the direction which intersects perpendicularly to the printing medium conveyed in an one direction A printing area detection means to detect ON field where the printing dot in 1 band field which is the printing control device which forms an image on a printing medium, and is equivalent to the print width printed by said print head by one scan of said carriage exists, and the OFF field where a printing dot does not exist, It is the printing control approach which is equipped with the speed-control means which carries out adjustable control of the passing speed of said carriage, and is characterized by controlling this speed-control means to make the carriage rate in said OFF field quicker than the carriage rate in said ON field in the migration in the 1 scan of said carriage.
[Claim 3] It is the printing control approach according to claim 2 which is further equipped with a means [a predetermined threshold / minimum distance / in the carriage migration direction of said OFF field], and is characterized by said speed-control means making a carriage rate quick in the OFF field concerned a condition [said minimum distance being larger than said predetermined threshold].

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the printing control approach and the equipment which change the scan speed of carriage dynamically and raise a total throughput especially about the printing control device of the mold which forms an image on a printing medium by the print head carried in carriage, making carriage scan in the conveyance direction and the direction which intersects perpendicularly to printing media, such as a form conveyed in an one direction.
[0002]
[Description of the Prior Art] This kind of the printing control approach has raised the total throughput (total printing time amount) from before by performing printing control to which carriage scan actuation is carried out with constant speed only in the field in which printing data (on-dot) exist rather than performing printing control according from the edge of a sheet to an edge to the carriage scan with constant speed on a printing medium.
[0003]
[Problem(s) to be Solved by the Invention] However, in the above-mentioned conventional example, in the field of an image, although printing data do not exist in the center section of the sheet when printing an image with which printing data exist only in the both ends of a printing medium since carriage scan speed is always fixed for example, it is the futility of time amount to carry out carriage scan actuation of the meantime at a fixed rate, as a result the total throughput of printing is influence.
[0004] The purpose of this invention detects the field where the printing data in a carriage scan field exist, and the field not existing, and is by carrying out adjustable control of the rate to both fields to offer the printing control approach and equipment which can raise the total throughput of printing.
[0005]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, the printing control approach by this invention By the print head carried in carriage, making carriage scan in the conveyance direction and the direction which intersects perpendicularly to the printing medium conveyed in an one direction The step which detects the null section which exists in the middle of two or more printing areas which can be set in 1 band field which is the printing control approach which forms an image on a printing medium, and is equivalent to the print width printed by said print head by one scan of carriage, The step which finds the minimum distance in the carriage scanning direction of this detected null section, It is characterized by having the step which confirms whether this found minimum distance is larger than the threshold defined beforehand, and the step to which the carriage rate in the null section concerned is made to increase from the usual carriage rate when it is judged beforehand that it is large.
[0006] Thus, in this invention, if the time amount which one scan will take by making the carriage rate in that null section increase if the null section of an image is in the interstitial segment of one scan of carriage can be shortened and this abbreviated time accumulates about each scan, total printing time amount will also be reduced. Consequently, improvement in the throughput of printing can be aimed at.
[0007] The printing control unit by this invention by moreover, the print head carried in carriage, making carriage scan in the conveyance direction and the direction which intersects perpendicularly to the printing medium conveyed in an one direction A printing area detection means to detect ON field where the printing dot in 1 band field which is the printing control device which forms an image on a printing medium, and is equivalent to the print width printed by said print head by one scan of said carriage exists, and the OFF field where a printing dot does not exist, It has the speed-control means which carries out adjustable control of the passing speed of said carriage, and this speed-control means is characterized by controlling to make the carriage rate in said OFF field quicker than the carriage rate in said ON field

in the migration in the 1 scan of said carriage.
[0008] It has further a means [a predetermined threshold / minimum distance / in the carriage migration direction of said OFF field], and, more specifically, said speed-control means may be made to make a carriage rate quick in the OFF field concerned a condition [said minimum distance being larger than said predetermined threshold]. It becomes possible only about the candidate for printing from which the increment control in a carriage rate becomes effective by this to perform the control concerned alternatively.
[0009]
[Embodiment of the Invention] It explains to a detail, referring to a drawing about the gestalt of suitable operation of this invention hereafter.
[0010] First, the outline configuration of the principal part related to this invention of the printing control unit by this invention is shown in drawing 1 . Although the printing method in the gestalt of this operation assumes the ink jet method, a printing method will not be asked if it is the printing control unit of the format that the image of predetermined width of face is printed with the scan (scan) of the print head carried in carriage. A printing control unit is equipped with CPU1, control (Application Specific Integrated Circuit) 2 and ASIC 6, the carriage (CR) driver 3, the CR motor 4, a linear encoder 5, and the band memory 7.
[0011] CPU1 carries out program control of the whole equipment with ROM, RAM, etc. which are not illustrated. Control ASIC 2 constitutes the carriage related control section which controls the CR driver 3 while counting the phase signal from a linear encoder 5 in response to the control signal from CPU1. The CR driver 3 drives the CR motor 4 under control of control ASIC 2. The CR motor 4 makes carriage scan through the power transmission device which is not illustrated. A linear encoder 5 detects the signal from the linear scale used for the feedback control of the CR motor 4, and generates the currency information of carriage. Control ASIC 6 constitutes the band memory control section which controls the band memory 7. The band memory 7 is the memory holding the image data of the bit map format for the width of face (band) printed at least with one scan of the print head carried in carriage.
[0012] Next, drawing 2 explains typical actuation of this invention roughly.
[0013] At the time of the power source ON of equipment, servo control of the carriage is carried out by the signal from a linear encoder 5, and it is in a standby condition. If data generation (expansion) of the image (picture) with which printing data exist only in the both-sides edge of the printing medium 8 as shown in drawing 2 is carried out to the band memory 7 First, CPU1 controls control ASIC 6, detects the data "1" field in the band memory 7 (ON field where a printing dot exists), and data "0" field (OFF field where a printing dot does not exist), and holds the address of each start of region, and the address of an end.
[0014] Next, in order to start printing, CPU1 outputs the rotation command of the CR motor 4 to control ASIC 2 based on said held address value. In this example, the printing direction accompanying carriage migration presupposes that it is a right end from a left end toward drawing.
[0015] First, in order to print the 1st field 21, carriage will be in a printing acceleration condition to a location (B point) just before the field concerned appears first from a position in readiness (A point), will be in a printing uniform condition a degree, and will print in this condition. Then, if it reaches to D point which will be in a migration acceleration condition in the location immediately after termination of the field concerned (C point), and serves as a predetermined top rate, it will be in a migration uniform condition.
[0016] Next, it will be in a migration moderation condition in the location in front of the predetermined distance of the 2nd appearing field 22 (E points) in order to print the field 22 concerned, and it goes into a printing uniform condition in the location in front of a field 22 (F points). After printing in this condition, it goes into a printing moderation condition and, finally a right end location (H points) is arrived at in the location just behind a field 22 (G points).
[0017] Thus, by making a carriage rate increase in the null section of the image in the pars intermedia of 1 scan of carriage, printing time amount of a carriage scan can be made quick, and the total through top can be raised. In performing bidirectional printing, also in hard flow, it performs same control.
[0018] By the way, acceleration and moderation of carriage take predetermined time amount so that the rate locus of the carriage of drawing 2 may show. Therefore, it must be more than the threshold that has the die length (mileage of carriage) of the null section in performing carriage high-speed migration in the above null sections. This distance may change with the control characteristic of carriage. In the null section more than the threshold concerned, I hear that high-speed migration control of carriage is possible, and carriage scan speed is shortened compared with the case where it does not perform high-speed migration control, and it is sometimes the need.
[0019] Drawing 3 is drawing having shown the data of the band memory 7 in the bit map format. In this example, the horizontal direction of drawing is the carriage scan direction. The number of a memory address of the upper left 1st line left ends is zero, and one by one, the n-th right end degree moves to the next line following the level right with the 1st

street [2nd / 3rd], and the address increases from the left end to the right end similarly. The data length of each addres is 8 bits, and ON/OFF of a printing dot is defined by each of this bit. An on-dot corresponds without a printing dot in those with a printing dot, and an off-dot on these specifications. The fields 31 and 32 (coordinate Hajime 35 and 37 is included, respectively) of drawing 3 show ON field.

[0020] Hereafter, the flow chart of drawing 4 explains the procedure of 1 band printing processing in the gestalt of this operation, referring to this drawing 3 .

[0021] When the image data is developed in the band memory 7 before printing of one band, the coordinate locations 35 and 37 in the horizontal direction of an on-dot field (for example, fields 31 and 33) which approached most are found (S1). Subsequently, it finds (S2)., the distance D, i.e., the minimum distance, between this coordinate location 35 and 37 This distance D is equivalent to the die length of the null section. Next, this minimum distance D confirms whether it is larger than threshold L defined beforehand (S3). With L [below], carriage is operated in the same Norma scan mode as usual, and one scan concerned is printed (S4). From L, if distance D is size, it will print one scan concerned in the acceleration scan mode of this invention (S5). In the Normal scan mode, the acceleration field, uniform field, and moderation field of carriage exist only once in 1 scan of carriage, respectively. On the other hand, in acceleration scan mode, those fields recognize multiple-times existence in 1 scan, respectively.

[0022] Drawing 5 is a flow chart which shows the example of detail procedure in the acceleration scan mode of step S5 of drawing 4 . Again, it explains, referring to the rate locus of the carriage of drawing 2 . First, the acceleration migration same from an A point to a B point as the Normal scan is performed (S21). A B point is the location of the just before at the left end of a field 21 (when dispersion is in a left end location, it is the location of the leftmost). Next, printing processing is performed, performing the uniform migration same from a B point to C point as the Normal scan (S22). C point is the location of the immediately after at the right end of a field 21 (when dispersion is in a right end location, it is the location of the rightmost). Next, acceleration migration for acceleration scan mode is performed from C point to D point (S23). D point is a location where a carriage rate reaches a predetermined top rate. Next, uniform migration for acceleration scan mode is performed from D point to E points (S24). These E points are the locations of I points which mention later only the distance which moderation takes to a front. Next, moderation migration for acceleration scan mode is performed from E points to F points (S25). F points are the locations of the just before at the left end of a field 22. Next, printing processing is performed, performing the uniform migration same from F points to G points as the Normal scan (S26). G points are the locations of the immediately after at the right end of a field 22. Finally, the moderation migration same from G points to H points as the Normal scan is performed (S27).

[0023] As mentioned above, although the gestalt of suitable operation of this invention was explained, it is possible to perform deformation and to make various change within technical limits indicated by the claim also besides having described above.

[0024] For example, when two or more distance D of the null section as shown in drawing 3 exists in the 1 scan direction, it is also possible to carry out high-speed migration of the above-mentioned carriage to each of those null sections. However, when two or more null sections exist in 1 scan, you may make it apply high-speed migration only to the greatest null section (for it to be size from distance D) for simplification of control. The example shown in drawing 5 corresponds, when performing high-speed migration only to the greatest null section in such 1 scan.

[0025]

[Effect of the Invention] As explained above, according to this invention, by detecting the field where printing data exist by the migration in 1 scan of carriage, and the field not existing, and carrying out adjustable control of the passing speed of carriage to the field where printing data do not exist, the 1 scan operating time of carriage can be shortened, as a result improvement in the total through top can be aimed at.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention] This invention relates to the printing control approach and the equipment which change the scan speed of carriage dynamically and raise a total throughput especially about the printing control device of the mold which forms an image on a printing medium by the print head carried in carriage, making carriage scan in the conveyance direction and the direction which intersects perpendicularly to printing media, such as a form conveyed in an one direction.

[Translation done.]

PRIOR ART

[Description of the Prior Art] This kind of the printing control approach has raised the total throughput (total printing time amount) from before by performing printing control to which carriage scan actuation is carried out with constant speed only in the field in which printing data (on-dot) exist rather than performing printing control according from the edge of a sheet to an edge to the carriage scan with constant speed on a printing medium.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, according to this invention, by detecting the field where printing data exist by the migration in 1 scan of carriage, and the field not existing, and carrying out adjustable control of the passing speed of carriage to the field where printing data do not exist, the 1 scan operating time of carriage can be shortened, as a result improvement in the total through top can be aimed at.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, in the above-mentioned conventional example, in the field of an image, although printing data do not exist in the center section of the sheet when print an image with which printing data exist only in the both ends of a printing medium since carriage scan speed is always fixed for example, it is the futility of time amount to carry out carriage scan actuation of the meantime at a fixed rate, as a result the total throughput of printing is influence.
[0004] The purpose of this invention detects the field where the printing data in a carriage scan field exist, and the field not existing, and is by carrying out adjustable control of the rate to both fields to offer the printing control approach and equipment which can raise the total throughput of printing.

[Translation done.]

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the printing control approach by this invention By the print head carried in carriage, making carriage scan in the conveyance direction and the direction which intersects perpendicularly to the printing medium conveyed in an one direction The step which detects the null section which exists in the middle of two or more printing areas which can be set in 1 band field which is the printing control approach which forms an image on a printing medium, and is equivalent to the print width printed by said print head by one scan of carriage, The step which finds the minimum distance in the carriage scanning direction of this detected null section, It is characterized by having the step which confirms whether this found minimum distance is larger than the threshold defined beforehand, and the step to which the carriage rate in the null section concerned is made to increase from the usual carriage rate when it is judged beforehand that it is large.
[0006] Thus, in this invention, if the time amount which one scan will take by making the carriage rate in that null section increase if the null section of an image is in the interstitial segment of one scan of carriage can be shortened anc this abbreviated time accumulates about each scan, total printing time amount will also be reduced. Consequently, improvement in the throughput of printing can be aimed at.
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[0008] It has further a means [a predetermined threshold / minimum distance / in the carriage migration direction of said OFF field], and, more specifically, said speed-control means may be made to make a carriage rate quick in the OFF field concerned a condition [said minimum distance being larger than said predetermined threshold]. It becomes possible only about the candidate for printing from which the increment control in a carriage rate becomes effective by this to perform the control concerned alternatively.
[0009]
[Embodiment of the Invention] It explains to a detail, referring to a drawing about the gestalt of suitable operation of this invention hereafter.
[0010] First, the outline configuration of the principal part related to this invention of the printing control unit by this invention is shown in drawing 1 . Although the printing method in the gestalt of this operation assumes the ink jet method, a printing method will not be asked if it is the printing control unit of the format that the image of predetermined width of face is printed with the scan (scan) of the print head carried in carriage. A printing control unit is equipped with CPU1, control (Application Specific Integrated Circuit) 2 and ASIC 6, the carriage (CR) driver 3, the CR motor 4, a linear encoder 5, and the band memory 7.
[0011] CPU1 carries out program control of the whole equipment with ROM, RAM, etc. which are not illustrated. Control ASIC 2 constitutes the carriage related control section which controls the CR driver 3 while counting the phase signal from a linear encoder 5 in response to the control signal from CPU1. The CR driver 3 drives the CR motor 4 under control of control ASIC 2. The CR motor 4 makes carriage scan through the power transmission device which is not illustrated. A linear encoder 5 detects the signal from the linear scale used for the feedback control of the CR motor 4, and generates the currency information of carriage. Control ASIC 6 constitutes the band memory control section which controls the band memory 7. The band memory 7 is the memory holding the image data of the bit map format

for the width of face (band) printed at least with one scan of the print head carried in carriage.
[0012] Next, drawing 2 explains typical actuation of this invention roughly.
[0013] At the time of the power source ON of equipment, servo control of the carriage is carried out by the signal from a linear encoder 5, and it is in a standby condition. If data generation (expansion) of the image (picture) with which printing data exist only in the both-sides edge of the printing medium 8 as shown in drawing 2 is carried out to the banc memory 7 First, CPU1 controls control ASIC 6, detects the data "1" field in the band memory 7 (ON field where a printing dot exists), and data "0" field (OFF field where a printing dot does not exist), and holds the address of each start of region, and the address of an end.
[0014] Next, in order to start printing, CPU1 outputs the rotation command of the CR motor 4 to control ASIC 2 based on said held address value. In this example, the printing direction accompanying carriage migration presupposes that it is a right end from a left end toward drawing.
[0015] First, in order to print the 1st field 21, carriage will be in a printing acceleration condition to a location (B point) just before the field concerned appears first from a position in readiness (A point), will be in a printing uniform condition a degree, and will print in this condition. Then, if it reaches to D point which will be in a migration acceleration condition in the location immediately after termination of the field concerned (C point), and serves as a predetermined top rate, it will be in a migration uniform condition.
[0016] Next, it will be in a migration moderation condition in the location in front of the predetermined distance of the 2nd appearing field 22 (E points) in order to print the field 22 concerned, and it goes into a printing uniform condition in the location in front of a field 22 (F points). After printing in this condition, it goes into a printing moderation condition and, finally a right end location (H points) is arrived at in the location just behind a field 22 (G points).
[0017] Thus, by making a carriage rate increase in the null section of the image in the pars intermedia of 1 scan of carriage, printing time amount of a carriage scan can be made quick, and the total through top can be raised. In performing bidirectional printing, also in hard flow, it performs same control.
[0018] By the way, acceleration and moderation of carriage take predetermined time amount so that the rate locus of the carriage of drawing 2 may show. Therefore, it must be more than the threshold that has the die length (mileage of carriage) of the null section in performing carriage high-speed migration in the above null sections. This distance may change with the control characteristic of carriage. In the null section more than the threshold concerned, I hear that high-speed migration control of carriage is possible, and carriage scan speed is shortened compared with the case wher it does not perform high-speed migration control, and it is sometimes the need.
[0019] Drawing 3 is drawing having shown the data of the band memory 7 in the bit map format. In this example, the horizontal direction of drawing is the carriage scan direction. The number of a memory address of the upper left 1st lin left ends is zero, and one by one, the n-th right end degree moves to the next line following the level right with the 1st street [2nd / 3rd], and the address increases from the left end to the right end similarly. The data length of each addres is 8 bits, and ON/OFF of a printing dot is defined by each of this bit. An on-dot corresponds without a printing dot in those with a printing dot, and an off-dot on these specifications. The fields 31 and 32 (coordinate Hajime 35 and 37 is included, respectively) of drawing 3 show ON field.
[0020] Hereafter, the flow chart of drawing 4 explains the procedure of 1 band printing processing in the gestalt of this operation, referring to this drawing 3 .
[0021] When the image data is developed in the band memory 7 before printing of one band, the coordinate locations 35 and 37 in the horizontal direction of an on-dot field (for example, fields 31 and 33) which approached most are found (S1). Subsequently, it finds (S2)., the distance D, i.e., the minimum distance, between this coordinate location 35 and 37 This distance D is equivalent to the die length of the null section. Next, this minimum distance D confirms whether it is larger than threshold L defined beforehand (S3). With L [below], carriage is operated in the same Norma scan mode as usual, and one scan concerned is printed (S4). From L, if distance D is size, it will print one scan concerned in the acceleration scan mode of this invention (S5). In the Normal scan mode, the acceleration field, uniform field, and moderation field of carriage exist only once in 1 scan of carriage, respectively. On the other hand, in acceleration scan mode, those fields recognize multiple-times existence in 1 scan, respectively.
[0022] Drawing 5 is a flow chart which shows the example of detail procedure in the acceleration scan mode of step S5 of drawing 4 . Again, it explains, referring to the rate locus of the carriage of drawing 2 . First, the acceleration migration same from an A point to a B point as the Normal scan is performed (S21). A B point is the location of the just before at the left end of a field 21 (when dispersion is in a left end location, it is the location of the leftmost). Next, printing processing is performed, performing the uniform migration same from a B point to C point as the Normal scan (S22). C point is the location of the immediately after at the right end of a field 21 (when dispersion is in a right end location, it is the location of the rightmost). Next, acceleration migration for acceleration scan mode is performed from

C point to D point (S23). D point is a location where a carriage rate reaches a predetermined top rate. Next, uniform migration for acceleration scan mode is performed from D point to E points (S24). These E points are the locations of I points which mention later only the distance which moderation takes to a front. Next, moderation migration for acceleration scan mode is performed from E points to F points (S25). F points are the locations of the just before at the left end of a field 22. Next, printing processing is performed, performing the uniform migration same from F points to G points as the Normal scan (S26). G points are the locations of the immediately after at the right end of a field 22. Finally, the moderation migration same from G points to H points as the Normal scan is performed (S27).

[0023] As mentioned above, although the gestalt of suitable operation of this invention was explained, it is possible to perform deformation and to make various change within technical limits indicated by the claim also besides having described above.

[0024] For example, when two or more distance D of the null section as shown in drawing 3 exists in the 1 scan direction, it is also possible to carry out high-speed migration of the above-mentioned carriage to each of those null sections. However, when two or more null sections exist in 1 scan, you may make it apply high-speed migration only t the greatest null section (for it to be size from distance D) for simplification of control. The example shown in drawing 5 corresponds, when performing high-speed migration only to the greatest null section in such 1 scan.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the outline configuration of the principal part related to this invention of the printing control device by this invention.
[Drawing 2] It is drawing showing the passing speed locus of carriage according to a data area in the gestalt of operation of this invention.
[Drawing 3] It is drawing having shown the data of the band memory in the gestalt of operation of this invention in the bit map format.
[Drawing 4] It is the flow chart which shows the procedure of 1 band printing processing in the gestalt of operation of this invention.
[Drawing 5] It is the flow chart which shows the example of detail procedure in the acceleration scan mode of step S3 of drawing 4 .
[Description of Notations]
1...CPU
2 ... Control ASIC
3 ... CR driver
4 ... CR motor
5 ... a linear encoder
6 ... Control ASIC
7 ... band memory
8 ... a printing medium

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]

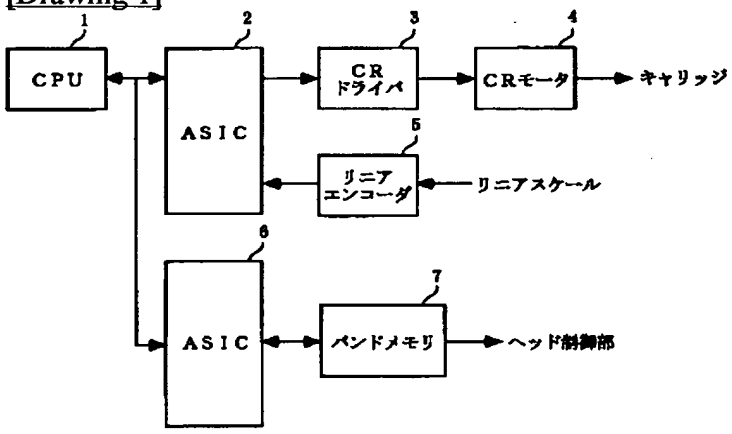
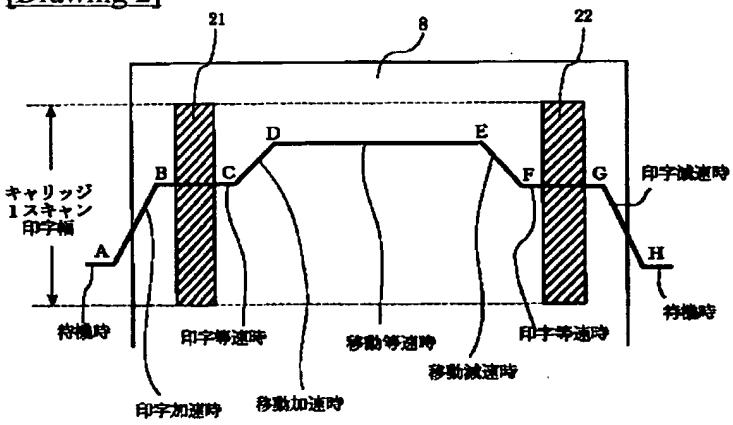


図1

[Drawing 2]



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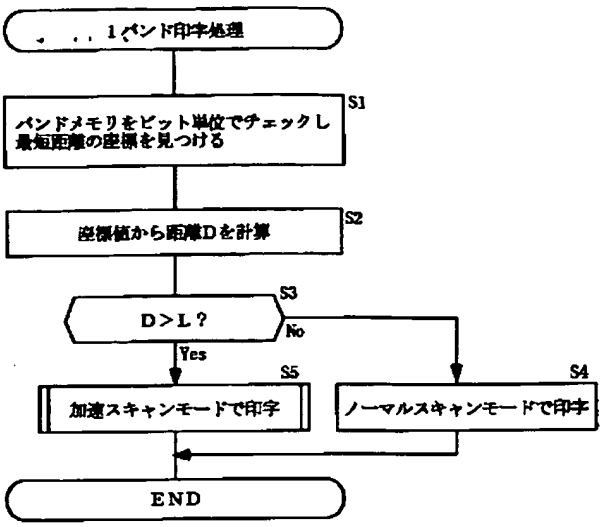
[Drawing 4]



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[Drawing 5]

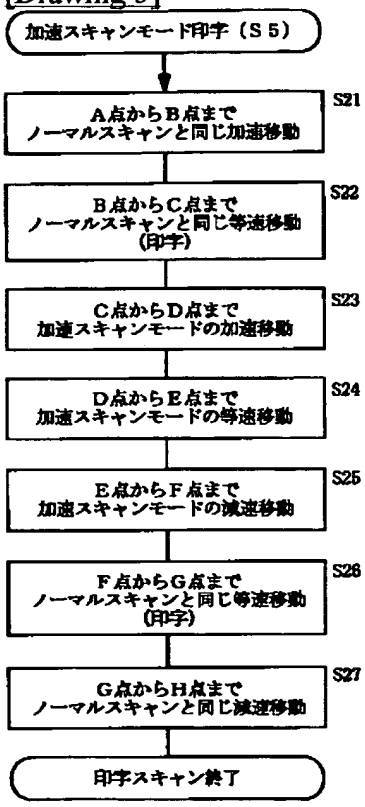

図5

[Drawing 3]

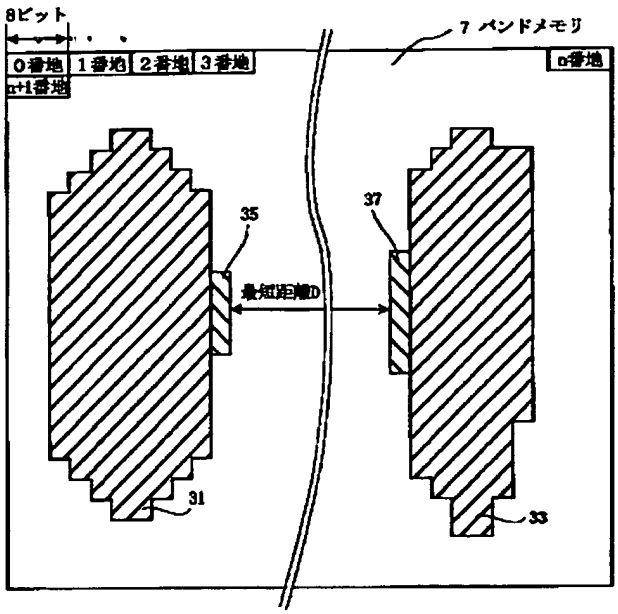

図3

[Translation done.]